
CHAPTER IV L

Merced National Wildlife Refuge Alternative Plans



U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
MID-PACIFIC REGION

CHAPTER IV L

MERCED NATIONAL WILDLIFE REFUGE

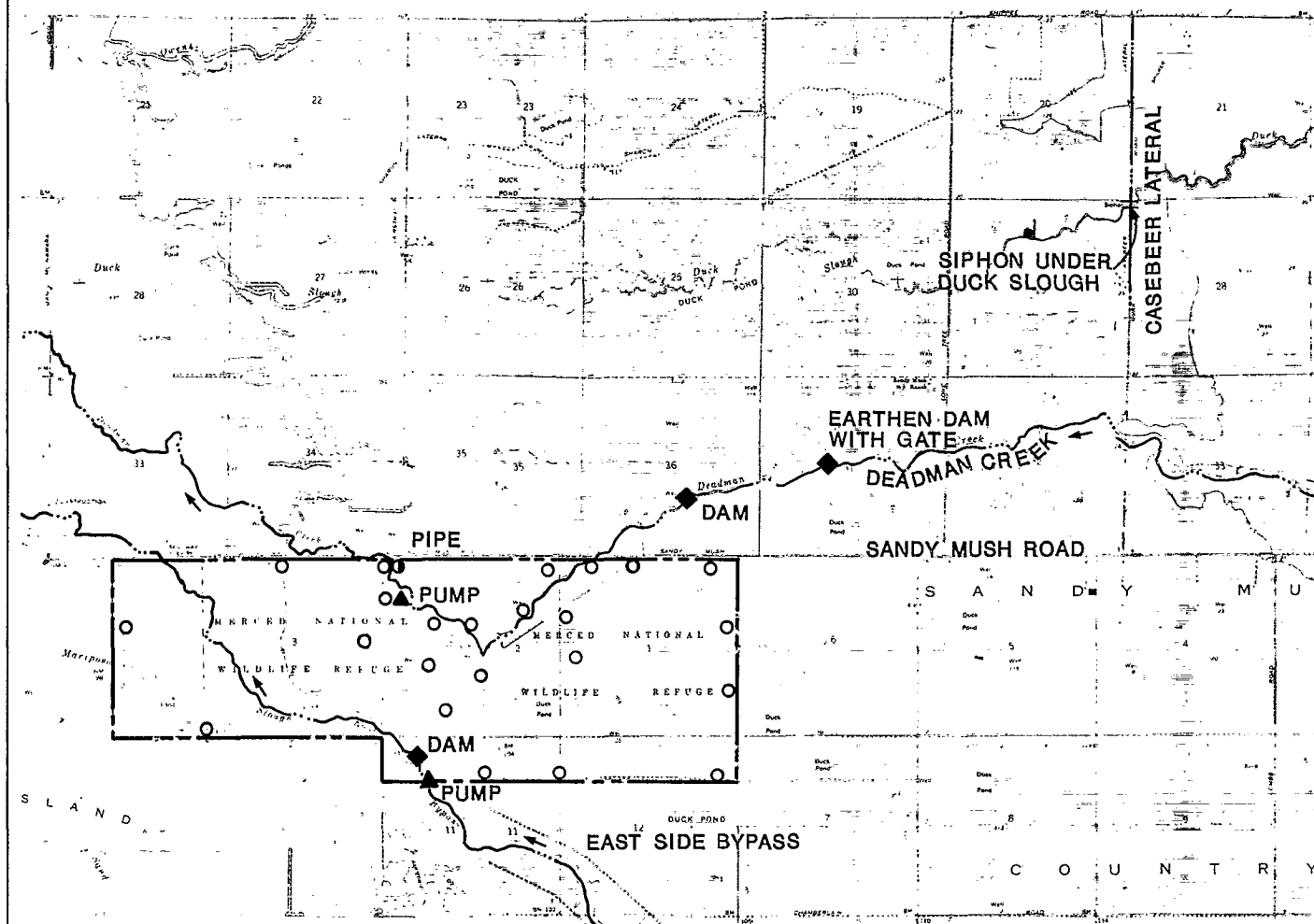
The Merced National Wildlife Refuge (NWR) was established in 1951 by authority of the Lea Act for the purpose of providing habitat for migratory and wintering waterfowl. The 2,562 acre refuge, managed by the Service, is a part of the San Luis NWR complex which forms an important part of the nesting, wintering, and migratory habitat in the San Joaquin Valley, as discussed in Chapter IV G. It is one of the most important wintering areas in California for up to 30,000 snow and Ross' geese and the lesser sandhill crane, which number up to 10,000 birds. The refuge also provides habitat for several endangered and candidate animal species, as shown on Figure IV L-1.

Merced NWR is located in Merced County approximately nine miles southwest of the City of Merced and about five miles east of the San Luis NWR. Deadman Creek and the East Side Bypass, tributaries of the San Joaquin River, bisect the refuge.

Land use at Merced NWR can be classified as wetland, cropland, and upland. Water application on Merced NWR is primarily for wetlands and croplands. Wetlands are made up of seasonal marshes which are disced and seeded every three to five years and flooded in the fall, but are not intensively farmed. Grain and forage crops are grown on the refuge to fulfill nutritional needs beyond those supplied by natural marsh vegetation, by providing high protein, and high carbohydrate foods. During 1982, 80 acres of cropland were converted to pasture for goose and sandhill crane habitat. Another 80 acres were converted in 1986. Much of the upland areas have been designated potential habitat for the endangered blunt-nose leopard lizard.

A. WATER RESOURCES

The annual water requirements and the dependable water supply for the Merced NWR are estimated by the Service to be 16,000 acre-feet and 0 acre-feet, respectively. The additional water would be utilized to expand crop and water grass production, to increase the acreage and duration of flooding, and to allow improved management techniques such as salt balance and disease control. The existing supply does not include water from agricultural return flows. Marshes generally use water year-round, and croplands use water from April through October.



LEGEND

- REFUGE BOUNDARY
- WATER COURSE
- DIRECTION OF FLOW
- WELL

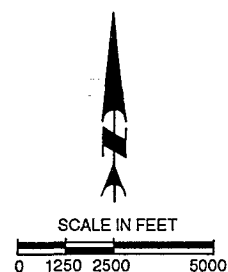


FIGURE IV L-1
MERCED NATIONAL WILDLIFE REFUGE
 EXISTING WATER SUPPLY FACILITIES

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1. Surface Waters

Water rights in Deadman Creek were obtained in 1985 for 3,000 acre-feet per year to be taken between December 15 and May 31. However, the majority of water for the refuge depends on groundwater pumped from 18 wells throughout the year. The duration of pumping depends on general weather conditions, and budget constraints.

Although groundwater currently provides two-thirds of the water supply, several surface sources deliver water to the refuge by gravity. Table IV L-1 lists the water supply sources and annual water delivered to Merced NWR.

2. Water Conveyance Facilities

Deadman Creek, which enters and exits the refuge at the north end, and the East Side Bypass, which traverses the west portion of the refuge, supply minimal amounts of water on an intermittent basis. These systems have adequate capacity for additional water conveyance.

Run-Off water was diverted from Deadman Creek during the winter months of 1981 and 1986 to aid in wetland management. Periodic water quality sampling has indicated no water quality problems.

Water was pumped from the East Side Bypass in 1983, 1985, 1986, and 1987. The East Side Bypass is part of the Lower San Joaquin River Flood Control Project. The bypass diverts San Joaquin River floodwaters around the San Joaquin River channel from a point just upstream of Mendota Pool to the point where Bear Creek joins the San Joaquin River. The bypass also intercepts waters from the Fresno River, Berenda and Ash Sloughs (which are tributaries of the Chowchilla River), the Chowchilla River, and Deadman, Owens, and Bear Creeks. The bypass conveys these waters to the San Joaquin River north of Merced NWR. Water quality in the East Side Bypass is unknown, however, refuge management suspects that no quality problems exist (USBR, 1986a).

A series of ditches supplying the refuge lands west of the East Side Bypass with groundwater do not have adequate capacity to convey additional water without extensive rehabilitation. A system of pipelines and open ditches supplying the refuge lands east of the East Side Bypass is also inadequate to convey full development water flows (USFWS, 1986h).

TABLE IV L-1
WATER DELIVERIES
MERCED NWR
(acre-feet)

Year	Wells	Mariposa Slough	Deadman Creek	Total
1977	17,317	0	0	17,317
1978	10,133	0	0	10,133
1979	15,227	0	0	15,227
1980	10,320	0	0	10,320
1981	7,271	0	160	7,431
1982	1,734	0	(a)	1,734 (b)
1983	559	113	(a)	672 (b)
1984	6,514	0	(a)	6,514
1985	6,266	187	0	6,453
1986	4,310	1,668	535	6,513

(a) Amount of diversion not measured

(b) 1982 and 1983 were extremely wet years with considerable flooding; thus, little pumping was required

Source: USF&WS, 1986h

3. Groundwater

The Merced NWR is located on the flood basin deposits of the San Joaquin River and is bordered on the west and southwest by unconsolidated younger alluvial river deposits. The groundwater level is usually up to 50 feet below the land surface.

Most of the water supplied to manage Merced NWR is pumped from wells, averaging 8,220 acre-feet per year (USBR memo to technical files dated 4/6/81). The safe groundwater yield was estimated to be 16,000 acre-feet per year (USBR, 1986a). Of the 23 existing wells located on the refuge, 16 are active.

Groundwater quality is generally good; less than 1,000 ppm of Total Dissolved Solids (TDS). One well was reported to have 2,600 ppm TDS. Boron concentrations are less than 3 ppm. There has been a reduction in groundwater pumping in recent years, particularly since 1980, due to increased energy costs and more efficient marsh management techniques.

B. FORMULATION AND EVALUATION OF ALTERNATIVE PLANS

In the past, wildlife areas have relied upon surplus surface water, agricultural return water, and groundwater for meeting water needs. To provide for full development of the refuge, the annual water requirement is 16,000 acre-feet per year. However, for the purposes of assessing the impact of water delivery alternatives, four levels of water supply have been identified and are presented in Table IV L-2. Each of the water supply levels provide a different rate and volume of water summarized as follows:

Level 1 - Existing firm water supply

Level 2 - Current average annual water deliveries

Level 3 - Water supply needed for full use of existing development

Level 4 - Water delivery needed for optimum management

Multi-objective project evaluation procedures, in accordance with concepts outlined by the Water Resources Council, is one of the tools used in evaluating and comparing alternatives. The Water Contracting EIS's will evaluate the national, regional, and site-specific environmental impacts of providing water to the refuges and other users under the different water supply levels. Based on the results of the Water Contracting EIS's water supply levels

TABLE IV L-2
DEPENDABLE WATER SUPPLY NEEDS
ALTERNATIVE SUPPLY LEVELS FOR THE MERCED NWR

Month	Supply Level 1		Supply Level 2		Supply Level 3		Supply Level 4	
	ac-ft	cfs	ac-ft	cfs	ac-ft	cfs	ac-ft	cfs
January	0	0.0	800	13.0	1,200	19.4	1,200	19.4
February	0	0.0	100	1.6	700	11.3	700	11.3
March	0	0.0	200	3.2	600	9.7	600	9.7
April	0	0.0	500	8.1	950	15.4	950	15.4
May	0	0.0	500	8.1	1,000	16.2	1,000	16.2
June	0	0.0	800	13.0	1,300	21.1	1,300	21.1
July	0	0.0	1,100	17.8	1,050	17.0	1,050	17.0
August	0	0.0	1,200	19.4	2,700	43.7	2,700	43.7
September	0	0.0	2,300	37.3	2,700	43.7	2,700	43.7
October	0	0.0	2,300	37.3	2,700	43.7	2,700	43.7
November	0	0.0	2,000	32.4	2,000	32.4	2,000	32.4
December	0	0.0	1,700	27.5	1,200	19.4	1,200	19.4
Total	0	0.0	13,500	218.7	16,000	264.1	16,000	264.1
Maximum	0	0.0	2,300	37.3	2,700	43.7	2,700	43.7

Notes:

- Alternative 1 Existing firm water supply
- Alternative 2 Current average annual water deliveries
- Alternative 3 Full use of existing development
- Alternative 4 Optimum management

Source: USFWS, 1987

will be identified for each refuge. Following completion of the Water Contracting EIS's, the plans to meet the identified water level will be compared under the National Economic Development Account, Environmental Quality Account, and Social Account.

The beneficial and adverse effects of each alternative to provide additional water to the refuge also were compared with respect to many criteria. A summary comparison of the alternatives to provide additional water to the refuge for Water Supply Levels 1,2,3, and 4 is presented in Table IV L-3.

The following delivery alternatives have been developed, as shown on Figure IV L-2, to convey four of the identified levels of water supply described above.

1. Delivery Alternative for Level 1 (No Action Alternative)

Since this level represents the existing dependable water supply, minimum construction and/or the use of existing facilities is required to provide a dependable conveyance system for the refuge.

Alternative A - Utilize the East Side Bypass. This alternative would provide for water from the El Nido Water District via the East Side Bypass, as shown on Figure IV L-1. Water would be pumped onto the east portion of the refuge from an existing pump at the southern border where the East Side Bypass enters the refuge. In addition, a PVC pipeline must be constructed to convey this pumped bypass water to the eastern part of the refuge. An additional pump would be constructed at this point to deliver water to the western side of the refuge. In order to most efficiently use existing distribution facilities, a ditch, 500 feet in length, would be constructed from the East Side Bypass to a new 20 cfs pump along the southern border, as shown in Figure IV L-2. Also, extensive levee rehabilitation, new water control structures (inlets and outlets), minor road graveling, etc. must be accomplished with this project to serve bypass wetlands. The existing supply of groundwater is adequate for these lands, however the cost of continuing to pump groundwater is undesirable.

2. Delivery Alternative for Level 2

Water Level 2 can be accommodated with the delivery alternatives for Level 1.

3. Delivery Alternative for Level 3

Under this level, construction and/or the use of existing conveyance facilities may be required to fully serve the existing developed portions of the refuge with an increase in water supplied. Additional water would extend the duration of flooding

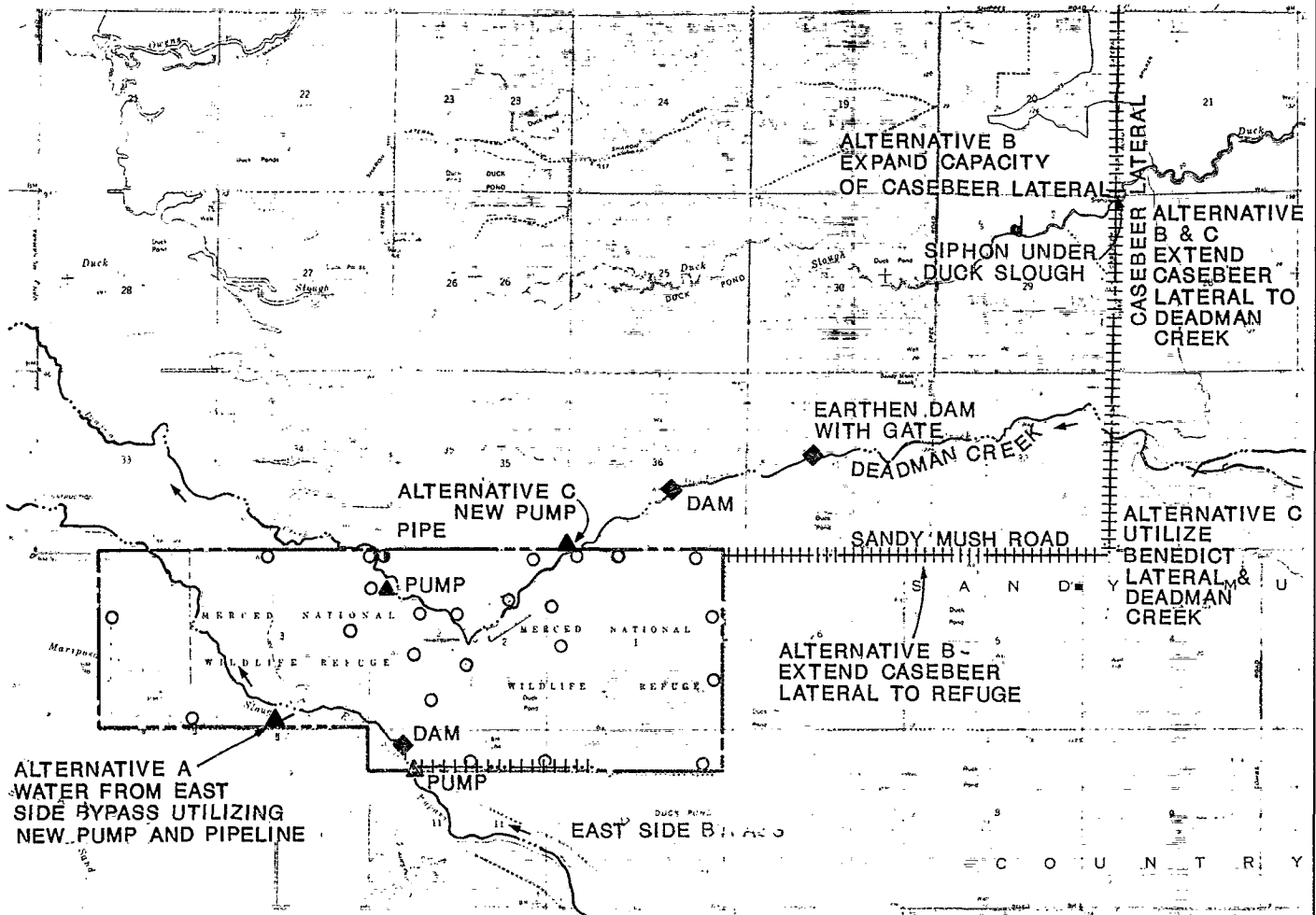
IV L-4

TABLE IV L-3
SUMMARY COMPARISON OF WATER DELIVERY ALTERNATIVES
MERCED NWR

	Supply Levels 1 & 2 Alternative A	Alternative B	Supply Levels 3 & 4 Alternative C	Alternative D	Alternative E
Availability of Water Supply	Yes	Yes	Yes	Yes	Yes
Ability to Convey Water	Yes	Most of the Year	Most of the Year	Yes	Most of the Year
Need New Water	Yes	Yes	Yes	Yes	Yes
Need New Conveyance Agreements	Yes	Yes	Yes	No	Yes
Type of Water Supply	Fresh Water and Ag. Return Flows	Fresh Water and Ag. Return Flows	Fresh Water and Ag. Return Flows	Fresh Blended with Groundwater	Tertiary Treated
Operational Flexibility	Unknown	Unknown	Unknown	Good	Unknown
Wildlife Habitat	Improve	Improve	Improve	Improve	Improve
Public Use	Improvement	Improvement	Improvement	Improvement	Improvement
Total Annual Costs (\$) ^(a)	50,400	15,630	54,640	-	-

Notes: Alternative A: East Side Bypass
Alternative B: Extend Casebeer Lateral to Refuge
Alternative C: Extend Casebeer Lateral to Deadman Creek
Alternative D: Conjunctive Use Plan
Alternative E: Treated Wastewater from Merced Treatment Plant

(a) Total Annual Costs includes annualized construction cost, annual operation and maintenance cost, annual power and wheelage cost.



LEGEND

- — — — — REFUGE BOUNDARY
- . . . — WATER COURSE
- DIRECTION OF FLOW
- WELL
- ||||| PROPOSED CONVEYANCE FACILITIES

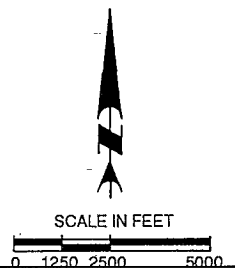


FIGURE IV L-2

MERCED NATIONAL WILDLIFE REFUGE

PROPOSED WATER SUPPLY FACILITIES ALTERNATIVES A, B, & C



earlier in the fall and later in the spring. Increased circulation and flow through would result in a decrease in water-fowl disease.

Alternative B - Extend Casebeer Lateral to Refuge Boundary. This alternative would require increasing the capacity of Merced Irrigation District's (MID) existing Casebeer Lateral and extending it south to Sandy Mush Road and west along Sandy Mush Road to the refuge, as shown in Figure IV L-2. Water in Casebeer Lateral is received from the Merced River. The existing capacity of 20 cfs in Casebeer Lateral would be increased to 50 cfs from the junction of Spilber Lateral to the current end of Casebeer Lateral. A flume would be required across Deadman Creek, as well as a siphon under Sandy Mush Road and three road crossings along the south side of Sandy Mush Road. This water delivery alternative is unable to provide water to the refuge during MID's maintenance season of the end of September until April.

Alternative C - Extend Casebeer Lateral to Deadman Creek. This alternative requires the extension of Casebeer Lateral to Deadman Creek. Deadman Creek could deliver 20 cfs from Benedict Lateral and 20 cfs from Casebeer Lateral. This alternative would require higher pumping costs to deliver the water to other parts of the refuge. This alternative is also unable to provide water to the refuge during MID's maintenance period.

Alternative D - Implement a Conjunctive Use Plan. Groundwater could be used during MID's maintenance period when the Casebeer and Benedict Laterals cannot transport an adequate amount of water. Wells would be constructed around the existing internal conveyance system; no other facilities are needed.

Alternative E - Utilize Treated Wastewater from the Merced Treatment Plant. Tertiary effluent from the City of Merced wastewater treatment plant could be delivered through Benedict Lateral and Deadman Creek. No facilities would be required aside from those mentioned under Alternative C. This alternative may be restricted during MID's maintenance period from late September to April.

4. Delivery Alternative for Level 4

Under this level, construction and/or the use of existing conveyance facilities may be required to fully serve the already developed areas as well as areas which have not yet been developed within the refuge. At full development, the existing acreage of 700 acres of wetlands would be increased to 1,200 acres. This additional acreage is located on sandier soils which would require more water per acre than the existing

acreage. A portion of the summer water may be applied to refuge agricultural fields to produce supplemental goose and crane food. Water Level 4 can be accommodated with the delivery alternatives for Level 3.

5. Summary of Alternatives

Alternative A has been considered for Levels 1 and 2. Alternative A would require long-term conveyance agreements. The construction and operation of additional facilities is required for pumping water from the East Side Bypass onto the refuge.

Alternatives B, C, D, and E have been considered for implementation of Levels 3 and 4. Alternative B would require extensive capital and operations costs and may be more disruptive environmentally than Alternative C, but it would allow for the water to be delivered to the northeast area of the refuge without additional pumping costs. Alternative C has less capital costs and environmental disruption but pumping would be required to serve the northeast area. Conveyance losses would occur due to the utilization of the creek to transport the water. Alternative D would require additional wells and groundwater use which could impact the current overdraft situation. Alternative E would utilize treated wastewater from the City of Merced.

C. COSTS AND ECONOMIC ANALYSIS

Costs for the preferred plans for providing adequate water supplies under the Water Supply Levels 1,2,3, and 4 are presented in Table IV L-4 and the Design Estimates Appendix. The construction costs include factors to cover engineering, contingencies, and overhead costs. During the advanced planning phase, these costs will be refined further.

Construction of the improvements under the alternative plans to provide Level 1,2,3, and 4 water deliveries would result in additional money being spent in Merced County during construction. The construction could be completed within one summer season by construction workers who reside in Merced County.

Currently, the annual public use to Merced NWR is about 1,700 visits per year. If water is provided throughout the year, the attendance levels would increase, but not significantly.

D. WILDLIFE RESOURCES

The annual waterfowl use on Merced NWR is approximately 7,522,350 use-days. Approximately 83 and 17 percent of the waterfowl use are by ducks and geese, respectively, including many species which nest on the refuge. Wildlife and fishery resources associated with the refuge are presented in Table IV

TABLE IV L-4
SUMMARY OF ESTIMATED COSTS OF ALTERNATIVE
MERCED NWR

Items	Water Delivery Levels				
	1 & 2	3 & 4			
	Alternatives				
	A	B	C	D	E
Total Constructions Costs	\$211,000	\$140,250	\$204,200	-	-
Power Costs (\$/acre-feet)	2.00	0.00	2.00	-	-
Water Purchase Wheeling Costs (\$/acre-foot)	0.00	0.00	0.00	-	-
Annualized Construction Costs (8.875%, 30 years)	20,300	13,490	19,640	-	-
Annual Operations & Maintenance Costs	3,200	2,140	3,000	-	-
Annual Power Cost	26,900	0	32,000	-	-
Annual Water Wheelage Cost	0	0	0	-	-
Total Annual Cost	\$ 50,400	\$ 15,630	\$ 54,640	-	-

Alternative A - Utilize the East Side Bypass

Alternative B - Extend Casebeer Lateral to Refuge Boundary

Alternative C - Extend Casebeer Lateral to Deadman Creek

Alternative D - Conjunctive Use

Alternative E - Utilize Treated Wastewater from the Merced Treatment Plant

TABLE IV L-5
WILDLIFE RESOURCES
MERCED NWR

Ducks

Mallard ^(a)	Gadwall ^(a)	American Wigeon ^(a)
Green-winged Teal ^(a)	Blue-winged Teal	Northern Shoveler ^(a)
Pintail ^(a)	Bufflehead	Canvasback ^(a)
Ruddy Duck ^(a)	Wood Duck	
Redhead ^(a)	Lesser Scaup	Ring-necked Duck
Cinnamon Teal ^(a)		

Geese and Swans

Snow Goose	White-fronted Goose	Cackling Canada Goose
Ross Goose	Canada Goose	Tundra Swan

Coots

American Coot

Shore and Wading Birds

American Avocet ^(a)	Long-billed Curlew	Snowy Egret ^(a)
Black-necked Stilt ^(a)	Killdeer ^(a)	Black-crowned Night Heron ^(a)
Common Snipe	Pied-billed Grebe ^(a)	Lesser Sandhill Crane
Long-billed Dowitcher	California Gull	Greater Sandhill Crane
Least Sandpiper	White Pelican	Virginia Rail ^(a)
Dunlin	American Bittern ^(a)	Sora
Western Sandpiper	Great Blue Heron	Common Moorhen ^(a)
Greater Yellowlegs	Great Egret	
	White-Faced Ibis	

TABLE IV L-5
WILDLIFE RESOURCES

MERCED NWR
(Continued)

Upland Game

Mourning Dove^(a)
Cottontail Rabbit

Ring-necked Pheasant
Black-tailed Rabbit

Raptorial Birds

Turkey Vulture
Sharp-shinned Hawk
Swainson's Hawk
Short-eared Owl

Black-Shouldered Kite^(a)
Cooper's Hawk
American Kestrel^(a)
Great Horned Owl^(a)

Northern Harrier^(a)
Red-tailed Hawk^(a)
Barn Owl^(a)
Burrowing Owl^(a)
Golden Eagle

Furbearers

Coyote
Skunk

Raccoon
Muskrat
Long-Tailed Weasel

Notes:

(a) Birds nesting on refuge

Source: Birds of San Luis, Merced and Kesterson Wildlife Refuges (RF 11660.3. August 1984),
NWRS Public Use Report (1) and refuge records.

L-5. The only listed threatened and endangered species associated with the Merced NWR are the San Joaquin kit fox, Vulpes macrotis mutica; Aleutian Canada goose, Branta canadensis leucopareia; American peregrine falcon, Falco peregrinus anatum; and bald eagle, Haliaeetus leucocephalus. Numerous candidate species may occur in this area and are also presented in Table IV L-6.

The preferred plan under water delivery Level 4 would provide an additional 2,250 acre-feet of water over the course of the year to improve habitat in the refuge. The improved habitat would increase the number of wildlife use days and recreational benefits, as presented in Table IV L-7.

Implementation of any of the alternative plans for Levels 2,3 and 4 of water supply would not adversely effect the listed and candidate threatened and endangered wildlife species. Detailed field investigations would be necessary during the advanced planning phase of the project. Implementation would result in overall beneficial environmental effects. The No Action Plan would result in the management of the refuge under the current water supply and existing conditions. The results of the preliminary environmental analysis for the selected plans are presented in the Environmental Appendix. Additional environmental analyses will be completed as part of the Water Contracting EIS's.

E. SOCIAL ANALYSIS

The social consequences of constructing and operating the preferred plan would be positive due to the potential increase in wildlife use and subsequently public use. The local social environment is discussed in the Social Appendix.

F. POWER ANALYSIS

PG&E serves the Merced NWR under the PA-1 rate schedule for agricultural users. A facility must be an authorized function of the CVP to receive project-use power. The authority to delivery CVP power to the refuge is currently being examined and will be detailed in the Refuge Water Supply Planning Report. A more detailed discussion of project-use power and wheeling agreements is provided in the Power Analysis section of Chapter IV B.

G. PERMITS

Construction activities would require several permits. Merced County would issue approvals to ensure that the existing drainage facilities would not be adversely effected. If the Merced Irrigation District facilities are utilized, their approval is

TABLE IV L-6

LISTED, PROPOSED, & CANDIDATE, THREATENED & ENDANGERED SPECIES

MERCED NWR

Listed Species

Mammals

San Joaquin kit fox, Vulpes macrotis mutica (E)

Proposed Species

None

Candidate Species

Birds

Bald eagle, Haliaeetus leucocephalus
American peregrine falcon, Falco peregrine anatum
Aleutian canada goose, Branta canadensis leucopa
Swainson's hawk, Buteo swainsoni (2)
White-faced ibis, Plegadis chihi (2)
Western snowy plover, Charadrius alexandrinus nivosus (2)
Tricolored blackbird, Agelaius tricolor (2)

Reptiles and Amphibians

Giant garter snake, Thamnophis couchi gigas (2)
California tiger salamander, Ambystoma tigrinum californiense (2)

Invertebrates

Molestan blister beetle, Lytta molesta (2)

Plants

Hispid bird's-beak, Cordylanthus mollis subsp. hispidus (2)
Delta coyote-thistle, Eryngium racemosum (1)
Bearded allocarya, Plagiobothrys hystriculus (2)
Valley spearscale, Atriplex patula subsp. spicata (2)

Source: USFWS, June 4, 1987

- (E)--Endangered (T)--Threatened (CH)--Critical Habitat
(1)--Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.
(2)--Category 2: Taxa for which existing information indicated may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

TABLE IV L-7
WILDLIFE RECREATIONAL BENEFITS AND RESOURCE IMPACTS
MERCED NWR

Item	Water Delivery Levels			
	Level 1	Level 2	Level 3	Level 4
Habitat Acres				
Permanent Water	0	20	50	60
Seasonal Marsh	0	880	1010	1140
Bird Use Days				
Ducks	0	4,110,000	4,740,000	5,360,000
Geese	0	1,870,000	2,150,000	2,440,000
Wading and Shorebirds	0	1,540,000	1,770,000	2,005,000
Endangered Species	0	2,350	2,700	3,060
Public Use Days				
Consumptive	0	450	600	750
Non-Consumptive	0	1,250	3,500	6,000
Annual Recreational Benefits	0	\$ 36,820	\$ 88,810	\$ 146,210

recommended. If water rights are to be obtained or modified, the State Water Resources Control Board would be granting the permits. Stream Alteration Permits would be required from the DFG and a Corps of Engineers permit would be required for construction activities in wetlands or riparian corridors.